Research Internship / Forschungspraxis

Documentation of a Vertical Farming Box

About the Chair of Renewable and Sustainable Energy Systems

The Chair of Renewable and Sustainable Energy Systems has a focus in energy system modeling. Models for different scales of time and space are developed to describe and understand present and future transition processes. Advanced methods for modeling technical and economical interactions are used to find optimal solutions with regard to economic benefits, external costs and environmental impacts.

Background

Vertical farming has emerged during the last decade as a way to grow food in a completely controlled environment. Indoor farming in stacked layers allows a very low water and much lower fertilizer demand compared to conventional farming on the field. It enables multiple harvests throughout the year and therefore a much higher yield. The big challenge is to decrease the very high energy demand for lighting and environmental control.

About this project

A prototype for a vertical farming (VF) box (1.20m x 0.95m x 1.9m) has been developed at the Chair to do research and to allow students to learn more about this innovative way of growing food. It is built as a framework with 30x30 mm² aluminum profiles. 4 LED modules, each one with 12 LED groups, are built into the box to illuminate the plants. The brightness of every LED group can be adjusted independently. The LED modules are water cooled. Furthermore, a ventilation system with 2 x 6 (supply) + 4 (exhaust) fans, an automated watering system and a monitoring system to evaluate crop growth and the energy demand have been implemented. Figures on page 2 depict the vertical farming box and its features.

The goal of the work is to develop a CAD model of the aluminum framework including its modules and to describe its technical specifications. The project can be conducted virtually. The main tasks are:

- 1) Developing a CAD-model of the vertical farming box
- 2) Considering the added features (lighting, watering, ventilation and monitoring system) in the model
- 3) Describing all technical specifications

Requirements

- Enrolled student in one of the master programs at TUM
- Good knowledge of German
- Interest in vertical/indoor farming
- Experience in CAD
- CV and current grade report

What we offer

- Exposure to state of the art research topics
- An international and multidisciplinary working environment

Chair of Renewable and Sustainable Energy Systems TUM School of Engineering and Design Technical University of Munich

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Fig. 1 Vertical Farming Box



Fig. 2 Part of the LED-water-cooling-system



Fig. 3 Plant room with LEDs and fans